

Severe Weather

Thunderstorms

Small intense weather systems that produce strong winds, heavy rains, lightning and thunder

Most occur along cold fronts

Need **warm, moist air and an unstable atmosphere**

1. The warm air rises around unstable cold air
2. The water vapor condenses as it cools and forms cumulus clouds
3. If the air is really unstable the warm air continues to rise to form a dark Cumulonimbus Cloud

Can produce: high winds, hail, tornadoes and flash floods- (quick flooding from heavy rains)

Lightning

An electric discharge that occurs between a **positively charged area and a negatively charged area**

Can happen between two clouds, Earth and a cloud or even two parts of the same cloud

Releases energy

The energy is transferred to the air and causes the **air to expand rapidly and send out sound waves = Thunder**

So, Lightning causes Thunder

Can produce power outages, fires, death and injury

Tornadoes

A small spinning column of air that has high winds and a low central pressure and it touches the ground

Happen in 1% of thunderstorms
Form in Cumulus clouds

Formation

1. Air moving in two directions causes a layer of air in the middle to spin
2. The spinning air is pushed upright (vertically) by strong updrafts of air
3. The spinning air moves to the bottom of the cloud and forms a funnel
4. When the funnel touches the ground it is a tornado







75% occur in the US

****Most happen in the spring and early summer. Tornado Alley – States in the mid west that are flat and in between the warm, moist air of the Gulf of Mexico and cold, dry air of Canada.**

F-Scale Converted to EF-Scale

F Scale	Wind Speed	EF-Scale	Wind Speed
F0	45-78	EF0	65-85
F1	79-117	EF1	86-109
F2	118-161	EF2	110-137
F3	162-209	EF3	138-167
F4	210-261	EF4	168-199
F5	262-317	EF5	200-234

Wind speeds in mph, 3-second gust

EF Rating	Wind Speeds	Expected Damage	
EF-0	65-85 mph	'Minor' damage: shingles blown off or parts of a roof peeled off, damage to gutters/siding, branches broken off trees, shallow rooted trees toppled.	
EF-1	86-110 mph	'Moderate' damage: more significant roof damage, windows broken, exterior doors damaged or lost, mobile homes overturned or badly damaged.	
EF-2	111-135 mph	'Considerable' damage: roofs torn off well constructed homes, homes shifted off their foundation, mobile homes completely destroyed, large trees snapped or uprooted, cars can be tossed.	
EF-3	136-165 mph	'Severe' damage: entire stories of well constructed homes destroyed, significant damage done to large buildings, homes with weak foundations can be blown away, trees begin to lose their bark.	
EF-4	166-200 mph	'Extreme' damage: Well constructed homes are leveled, cars are thrown significant distances, top story exterior walls of masonry buildings would likely collapse.	
EF-5	> 200 mph	'Massive/incredible' damage: Well constructed homes are swept away, steel-reinforced concrete structures are critically damaged, high-rise buildings sustain severe structural damage, trees are usually completely debarked, stripped of branches and snapped.	

Hurricanes

A large rotating weather system with wind speeds of at least **74 mph**

Most powerful storms on Earth

Also called typhoons and cyclones in other parts of the World

****Strong over water, weak over land**

Formation

1. Begin as thunderstorms over warm tropical waters
2. Winds from two different directions meet and cause the storm to spin
3. Becomes a Tropical Storm
4. The Coriolis Effect causes the storm to spin counterclockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere
5. Gains energy from the condensation of water vapor. The more warm air that rises, the more water vapor.
6. When winds reach 74mph it officially becomes a hurricane
7. Stays strong over water and weakens over land

Meteorologists have gotten better at predicting and following hurricanes because of technology like satellites

Hurricane Deaths have decreased over the years but property damage has increased. Why?

Stages of a Hurricane

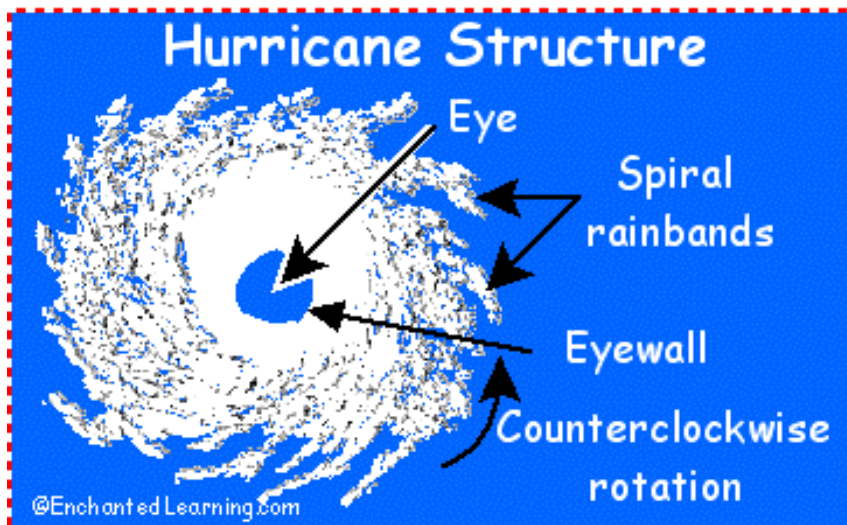
Hurricane Stage	What will occur during this stage?
Tropical Wave	A low pressure trough of persisting winds that blow from east to west.
Tropical Disturbance	An organised area of thunderstorms that lasts for at least 24 hours and is accompanied by heavy rains and gusty winds.
Tropical Depression	An organised area of tropical low pressure in which sustained winds are 38 mph or less.
Tropical Storm	A tropical cyclone with maximum wind speeds of 39-73 mph and accompanied by thunderstorms.
Hurricane	A tropical cyclone with maximum winds of at least 74 mph and accompanied by thunderstorms.

Parts

Rain Bands- outside layer that produce heavy rain and high winds

Eye Wall- the middle layer- heavy rains and high winds. The strongest part of the storm

Eye- The middle of the storm – warm calm air, low pressure and light winds

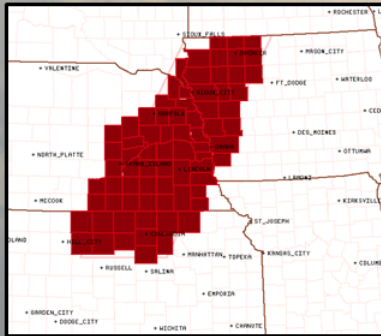


Scale Number (Category)	Sustained Winds (MPH)	DAMAGE	Storm Surge
1	74-95	Minimal: Unanchored mobile homes, vegetation and signs.	4-5 Feet
2	96-110	Moderate: All mobile homes, roofs, small crafts, flooding.	6-8 Feet
3	111-130	Extensive: Small buildings, low-lying roads cut off.	9-12 Feet
4	131-155	Extreme: Roofs destroyed, trees down, roads cut off, mobile homes destroyed. Beach homes flooded.	13-18 Feet
5	155 - +	Catastrophic: Most buildings destroyed. Vegetation destroyed. Major roads cut off. Homes flooded.	Greater Than 18 Feet

Watch vs Warning

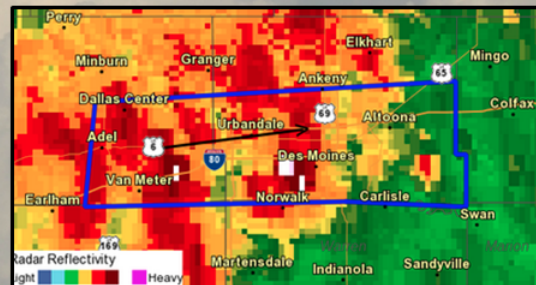
Watch

- Conditions are primed for severe weather development.
- Issued up to 8 hours in advance of severe weather.
 - Covers a large area.
- Take necessary precautions in case bad weather strikes!



Warning

- Severe weather is occurring or imminent.
 - Covers a small area.
- When a warning is issued, **take action immediately** to protect your life and property!



weather.gov/desmoines



NWS Des Moines

HURRICANE SAFETY TIPS



Take these steps to prepare yourself, and your loved ones from dangerous weather.

Have An Emergency Plan

Create an emergency plan and review it with everyone in your home. Make sure everyone knows the safest location in the home.



Follow Emergency Instructions



Follow all instructions from authorities regarding evacuation or other safety protocols. Check radio, television or other media outlets for emergency information.



Have an Evacuation Route

Make sure you know your evacuation route before the hurricane hits and keep a full tank of gas.



Stock Up On Supplies

Be sure to have the proper necessities, such as: water, blankets, first aid kits, flashlights, batteries, radios, and any pet care items.



Protect Important Documents

Make sure important documents such as ID cards and other vital information are placed in a secured, waterproof container.



Out-Of-Town Contact

Make sure to have an out-of-state friend or family member as a contact, so they can check on your whereabouts.



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Tornado Safety Tips

Practice and Prepare

Know where you'll meet your family during the tornado (and after). Practice a tornado drill annually. Keep a weather radio in your storm shelter, along with safety supplies.

Seek Shelter

Go to your basement, a small interior room, or under stairs on the lowest floor of the house. If you live in a mobile home, get out and look for a stable building. If outside, find low ground—away from trees and cars—and lie face down with your arms protecting your head.

After the Storm

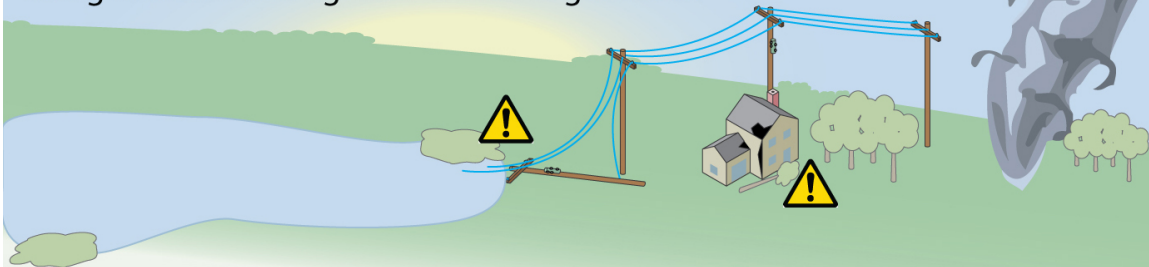
Stay away from downed power lines, and avoid flooded areas—power lines could be submerged and still live with electricity. Don't enter seriously damaged buildings and avoid using matches and lighters in case of gas leaks.

Know the Signs

Look for swirling clouds.

Watch for quick wind shifts or stark calm after heavy rain.

Listen for a loud roar or rumble that doesn't fade.



Source: National Oceanic and Atmospheric Administration and Funnel, Inc.

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4	131-155	Extreme: Roofs destroyed, trees down, roads cut off, mobile homes destroyed. Beach homes flooded.	13-18 feet
5	More than 155	Catastrophic: Most buildings destroyed. Vegetation destroyed. Major roads cut off. Homes flooded.	Greater than 18 feet

The Stages of a Hurricane

Hurricane Stage	What will occur during this stage?
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The Fujita Tornado Scale

Category FO-- Gale Tornado Category 40 - 72 mph-- Light damage: some damage to chimneys, breaks branches off trees, pushes over shallow-rooted trees, and damages sign boards.

Category F1-- Moderate Tornado Category 73 - 112 mph-- Moderate damage: The lower limit Category 73 mph-- is the beginning of hurricane wind speed, peels surfaces of roofs, mobile homes pushed off foundations or overturned, and moving autos pushed off roads.

Category F2-- Significant Tornado Category 112 - 157 mph-- Considerable damage: Roofs torn off the frames of houses, mobile homes demolished, boxcars pushed over, large trees snapped or uprooted, and heavy cars lifted off ground and thrown

Category F3-- Severe Tornado Category 158 - 206 mph-- Severe damage: Roofs and some walls torn off well-constructed houses, trains overturned, most trees in forest uprooted, and heavy cars lifted off ground and thrown.

Category F4-- Devastating Tornado Category 207 - 260 mph-- Devastating damage: Well-constructed houses leveled, structures blown off weak foundations, and cars and other large objects thrown about.

Category F5-- Incredible Tornado Category 261 - 318 mph-- Incredible damage: Strong frame houses are lifted off foundations and carried a considerable distance and disintegrated, automobile sized missiles fly through the air in excess of 100 meters, and trees debarked.

Category F6+-- Inconceivable Tornado Category 319 - 379 mph-- The maximum wind speed of tornadoes is not expected to reach the F6 wind speeds.

Tornadoes can be classified into one of three types:

Weak Tornadoes Category F0/F1-- These tornadoes account for 74% of all tornadoes. They cause less than 5% of tornado deaths. Their lifetime is usually 1 - 10+ minutes with wind speeds less than 113 mph.

Strong Tornadoes Category F2/F3-- These tornadoes account for 25% of all tornadoes. They cause nearly 30% of all tornado deaths and may last 20 minutes or longer. Their wind speeds are clocked between 113 and 206 mph.

Violent Tornadoes Category F4/F5-- These rare tornadoes account for less than 2% of all tornadoes. However, they cause 67% of all tornado deaths nationwide. They may last for one hour or more with wind speeds greater than 206 mph.

(Copied from <http://www.essdatarecovery.com/tornado.asp>)

Tornado Safety

Tornado Watch – it may happen

Tornado Warning – it has been spotted

1. Get inside (If outside lay down completely flat, preferably in a ditch or open field)
2. Go to an interior room, closet or surrounded area on the first floor or basement
Away from windows or any glass
3. Crouch down and cover your head
4. Afterwards, listen to the radio for an all clear
5. Avoid downed power lines and damaged structures
6. Use flashlights to inspect your area, do not use candles or matches (damaged gas lines)

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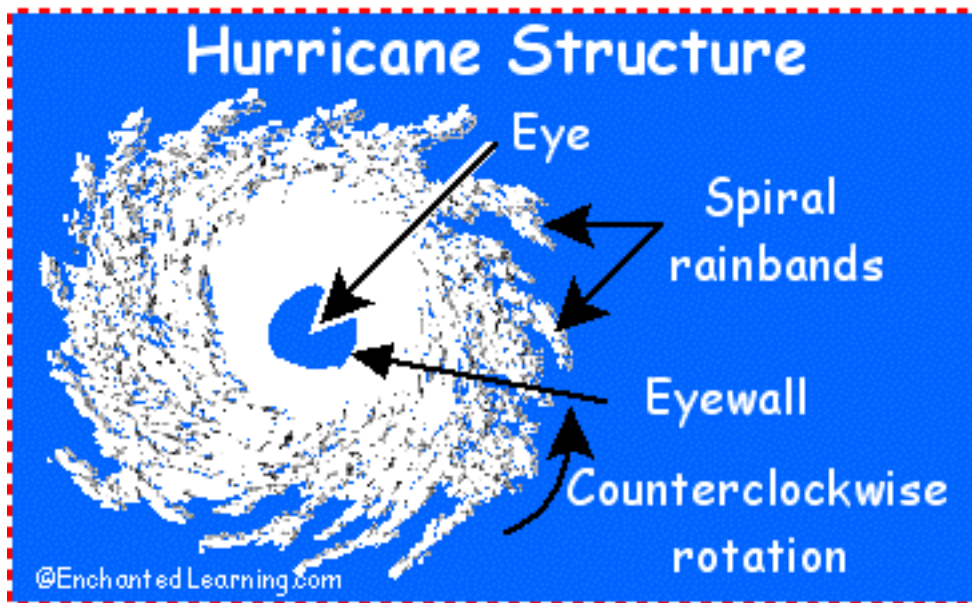
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[http://www.enchantedlearning.com/subjects/weather/hurricane/gifs/hurricanestructure.GIF](http://www.enchantedlearning.com/subjects/weather/hurricane/gifs/hurricanestructure.gif)

Categories of Hurricanes

<http://www.nhc.noaa.gov/aboutsshs.shtml>

Naming Hurricanes

<http://kids.earth.nasa.gov/archive/hurricane/names.html>

Hurricane Safety

<http://www.usatoday.com/weather/whurwrn.htm>